

CAN/CSA- CSA C61400-1 Wind Turbines

This document provides an overview of the requirements of CAN/CSA- C61400-08 Wind Turbines with respect to welding. It is designed to provide guidance for individuals and organizations involved in the design and fabrication of mobile homes.

This document is only for general guidance purposes; reference to the full text of CSA C61400 should be made. For further information, please contact the CWB at 1-800-844-6790 or info@cwbgroup.org.

Introduction

Welding is a key joining method used in the fabrication of wind towers. To ensure welds of the highest quality and the safety of both the users of wind turbines and the general public, CSA Standard C61400 provides specific requirements around the design, welded fabrication and erection of wind towers.

Welded Fabrication

CSA C61400 provides the following requirements:

Part 1: Design requirements

Clause 7: Structural design

7.1 General:

The integrity of the load-carrying components of the wind turbine structure shall be verified and an acceptable safety level shall be ascertained. The ultimate and fatigue strength of structural members shall be verified by calculations and/or tests to demonstrate the structural integrity of a wind turbine with the appropriate safety level. The structural analysis shall be based on ISO 2394.

Note 1A: For Canada, see also Paragraphs 3 to 7 in Commentary A of the NRCC's User's Guide — NBC 2010: Structural Commentaries (Part 4 of Division B).

7.2 Design methodology:

It shall be verified that limit states are not exceeded for the wind turbine design. Model testing and prototype tests may also be used as a substitute for calculation to verify the structural design, as specified in ISO 2394.

Note 1A: For Canada, see also Paragraphs 3 to 7 in Commentary A of the NRCC's User's Guide — NBC 2010: Structural Commentaries (Part 4 of Division B).

Part 2: Design requirements for small wind turbines

Clause 7: Structural design

7.1 General:

Wind turbine structural design shall be based on verification of the structural integrity of the components in the critical load paths from the rotor blades to the foundation. The ultimate and fatigue strength of structural members shall be verified by calculations and/or tests to determine the structural integrity of a SWT with the appropriate safety level. The structural analysis shall be based on ISO 2394 or equivalent, where applicable.

Note 1A: For Canada, see also Paragraphs 3 to 7 in Commentary A of the NRCC's User's Guide — NBC 2010: Structural Commentaries (Part 4 of Division B).

7.2 Design methodology:

It shall be verified that the limit states are not exceeded for the wind turbine design.

There are three ways given to determine the design loads for the turbine:

- simplified load equations (7.4);*
- aeroelastic modeling (7.5); and*
- mechanical loads testing (7.6).*



Note 1A: For Canada, see also Paragraphs 3 to 7 in Commentary A of the NRCC's User's Guide — NBC 2010: Structural Commentaries (Part 4 of Division B).

Part 4 of National Building Code of Canada (NBCC) that is referenced in the above standards states that: Structural members shall conform to CAN/CSA S16 "Design of Steel Structures"(former Limit State Design)

Clause 24.3 of CAN/CSA S16 standard states: "Fabricator and erector qualification Fabricators and erectors responsible for welding structures fabricated or erected under this Standard shall be certified by the Canadian Welding Bureau to the requirements of CSA W47.1 (Division 1 or Division 2), CSA W55.3, or both, as applicable. Part of the work may be sublet to a Division 3 fabricator or erector; however, the Division 1 or Division 2 fabricator or erector shall retain responsibility for the sublet work."

CAN/CSA-S16 provides requirements for welding fabrication and erection. All welding fabricators shall be certified to CSA Standard W47.1 for welding and erection of steel structures and to CSA Standard W47.2 for welding and erection of aluminum structures.

CSA Standard W47.1 provides requirements for the qualification of welders and welding operators, welding procedures and welding supervisory and engineering personnel. A company certified to CSA W47.1 Division 1 requires having full time engineer(s) and a company certified to Division 2 requires having retained part time engineer(s).

CSA Standard W47.1 requires all fabricators to submit for review and acceptance in accordance with this and other applicable governing standards (e.g., CSA W59) all welding procedure specifications and welding procedure data sheets.

CSA Standard W59 provides guidance on weld design, fabrication techniques, inspection and other key considerations around welding for steel respective aluminum. CSA W59 requires that contractors performing work under this standard be certified under the requirements of CSA Standard W47.1.

An organization meeting the requirements of CSA Standard W47.1 will have qualified welders, operators, accepted welding procedures and accepted supervisory/engineering personnel. All elements of the welding operation will be independently verified by the Canadian Welding Bureau on an on-going basis.

Please note that there are no domestic or international equivalents to CSA Standard W47.1. Other national systems, such as that of the American Welding Society (AWS) do not include key concepts such as independent and on-going verification and welding supervisors/engineers. The CWB strongly cautions the reader around accepting substitutions; doing so may contravene the intent of CSA C61400 and place public safety at risk.

For a listing of all organizations that currently meet the requirements of CSA Standard W47.1 please see www.cwbgroup.org.

Welding Inspection

CSA Standard W59 requires that all welds be visually inspected. In addition, when required by contract weld inspection must be completed by certified welding inspectors or a welding inspection organization following the requirements of CSA Standard W178.2 or CSA Standard W178.1 respectively. It also requires that CSA Standard W59 be followed for the acceptance criteria for all welds. It should be noted that CSA Standard W178.2 has individual "product categories" that inspectors may qualify to, including one for CSA Standard W59 and one for CSA Standard W59.2.

For a listing of all organizations and individuals who currently meet the requirements of CSA Standard W178.1 and CSA Standard W178.2, please see www.cwbgroup.org.

